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NOTES

ON

RECENT CASES OF SMALLPOX

IN

GOVAN AND KINNING PARK

Being a Thesis for the Degree of Doctor of Medicine

By

JOHN PATON, M.B., Ch.B.

Glasgow

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N O T E S

on

RECENT CASES OF SMALLPOX

in

GOVAN AND KINNING PARK

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During the past four years Govan and Kinning Park, following in the footsteps of Glasgow, have been visited with three outbreaks of Smallpox, each more severe than any that have occurred for many years before. From the pandemic, thirty years ago, until the beginning of the new century, there has been very little Smallpox in the district. The cases which have occurred in the past twenty years have been treated at the Combination Fever Hospital, Shieldhall, into which other infectious cases are also admitted.

Although a full account of each case has not been kept, I hope that the notes on these cases will not be without value, considering also that they are a portion of the cases which have occurred in what will be the

greater city of Glasgow.

From the winter of 1873-74, when thirty-four cases occurred with six deaths, until 1900, the visits of Smallpox were mild in nature, and only occurred at intervals of a few years. Between 1874 and 1900 sixty-two cases occurred in the district. Four of these were in 1877, four in 1883, five in 1884, four in 1885-86, one in 1890, twenty-two in 1893, ten in 1894, and thirteen in 1895, with eight deaths or a mortality of 12.9%. Of these sixty-two cases, eleven or 17% were under twelve years of age, and of the eight deaths, three occurred in children under one year, these being unvaccinated infants aged three weeks, four weeks, and four weeks respectively. The other five deaths occurred in adults. Two of these are noted as being unvaccinated, one as having been vaccinated in infancy, aged 32, one vaccinated in infancy and having had Smallpox previously, aged 29, and of another there is no note.

With the beginning of the new century, however, Smallpox has shewn a remarkable increase in the district. In 1900-01, 135 cases were dealt with here with a mortality of eighteen or 13.3%. Again in 1901-02, 115 cases were admitted, with a mortality of fifteen or 13.04%. The winter of 1902-03 passed without a case being admit-

ted, but again in the past winter, during my period of residence, there has been an outbreak of Smallpox even more severe than the preceding, the number of cases admitted being 227, with eighteen deaths or a mortality of 7.9%. These outbreaks have occurred, as a rule, during the first five months of the year, beginning generally about the end of the preceding October, being most severe during the first three months of the year, and then gradually declining until the end of June or July. The only exception to this rule occurred in 1877 when four cases only occurred, these being in the months of June and July.

VACCINATION. The vaccination records of these last three outbreaks shew, in a striking manner, the protective and modifying influence of successful vaccination against Smallpox.

Altogether, 477 cases were admitted, with 51 deaths or 10.7%. Of these, fifty-five are noted as having no vaccination mark, and of the latter twenty-four or 43.6% died. Of the remaining 422 cases, twenty-seven, including two of whom the vaccination is not noted, or 6.3% died. Of the cases admitted last winter thirty-four had no vaccination mark, and one hundred and ninety-three had either primary marks or had been vaccinated in the incubation period.

NO VACCINATION MARK - CASES 34

Deaths 12 or 31%

Recovered 22
(Confluent - 13%
(Severe - 37%
(Mild - 50%
(Pitted, App. - 54%

VACCINATED - 193

Deaths 6 or 3.1%

Recovered 187
(Confluent - 22%
(Severe -
(Mild - 77%
(Pitted, App. - 18%

The mortality agrees with the contention of Cory (1) that since the introduction of vaccination, the death-rate in unprotected cases has increased. This is more noticeable when cases stated to have been vaccinated in infancy, but having no mark, are separated from those who had never been vaccinated, thus:-

MORTALITY - CASES 227

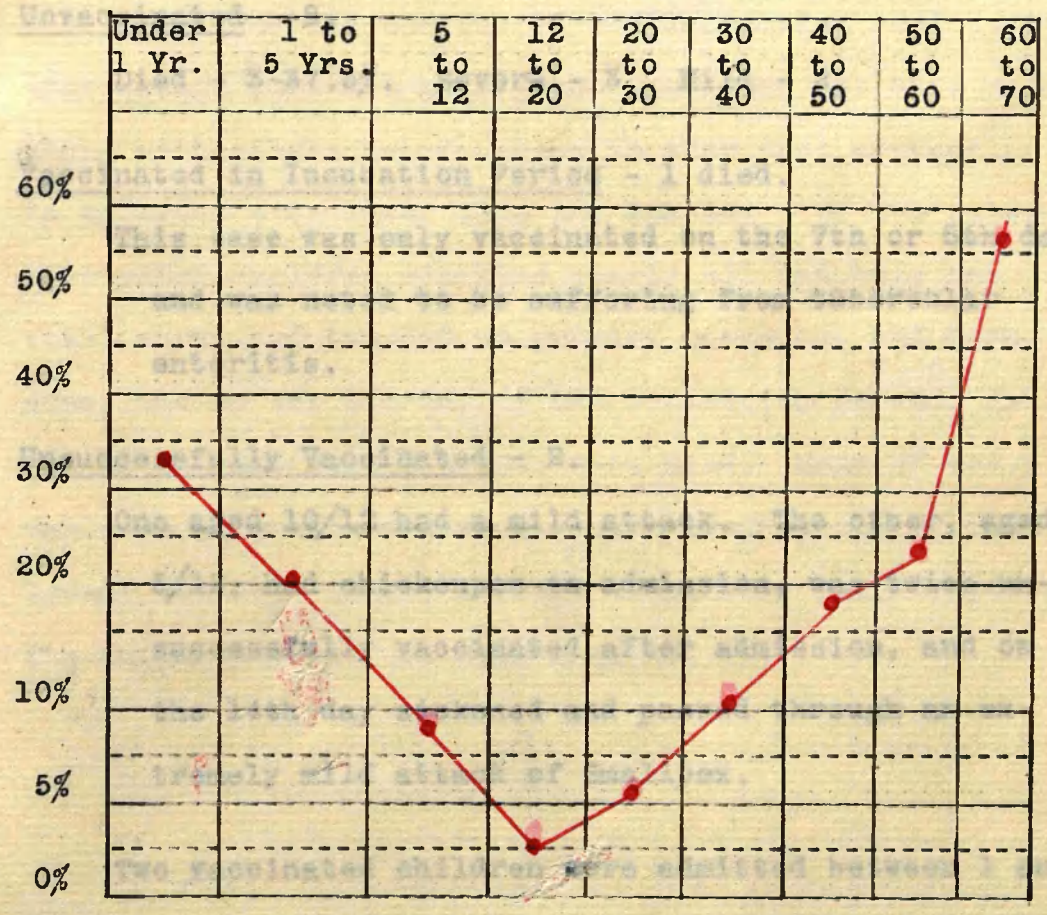
Unvaccinated	46.1%
Stated to have been vaccinated but having no mark	28.5%
One vaccination mark	3.6%
Two " "	3.9%
Three " "	0
Four or more "	0
Re-vaccinated	0

During the past four years fifty-one patients died of Smallpox, and of these twenty-four had no vaccination mark. No case had been re-vaccinated prior to the incubation period, but two had been re-vaccinated a few days before the rash appeared. One of the latter was a weakly infant of six months, the other a woman aet. 32, a hemorrhagic case who was seven months pregnant, and had a complicating severe attack of pneumonia.

As is usual in recent outbreaks of Smallpox, comparatively few children were attacked, with the exception of unprotected infants and children in whom vaccination had been imperfectly performed. Neglecting vaccination the death-rate under 1 year was 33.3%. It then gradually fell until between 12 and 20 it was only 2.5%. Between 20 and 30 it was 5.4%, and gradually rose until between 60 and 70 it was 57.1%.

DEATH-RATE IN VACCINATED AND UNVACCINATED

CASES 477



There is a marked difference, however, in the curves between vaccinated and unvaccinated. Twelve children of one year or under have been admitted in the past four years.

Successfully Vaccinated - 1 aged 6/12.

This case was very mild, and was infected from the mother who died.

Unvaccinated - 8.

Died - 3-37.5%. Severe - 3. Mild - 2.

Vaccinated in Incubation Period - 1 died.

This case was only vaccinated on the 7th or 8th day, and was noted to be suffering from tubercular enteritis.

Unsuccessfully Vaccinated - 2.

One aged 10/12 had a mild attack. The other, aged 5/12, had chickenpox on admission, was twice unsuccessfully vaccinated after admission, and on the 14th day sickened and passed through an extremely mild attack of Smallpox.

Two vaccinated children were admitted between 1 and 5 years, and seventeen between 5 and 12 years, but all were mild except one. Nine unvaccinated children were admitted under twelve years, and of these three died, and only one was mild. Of the vaccinated children admitted between 1 and 5 years, one aged four having one mark had a moderate attack. The other, aged two, had no primary

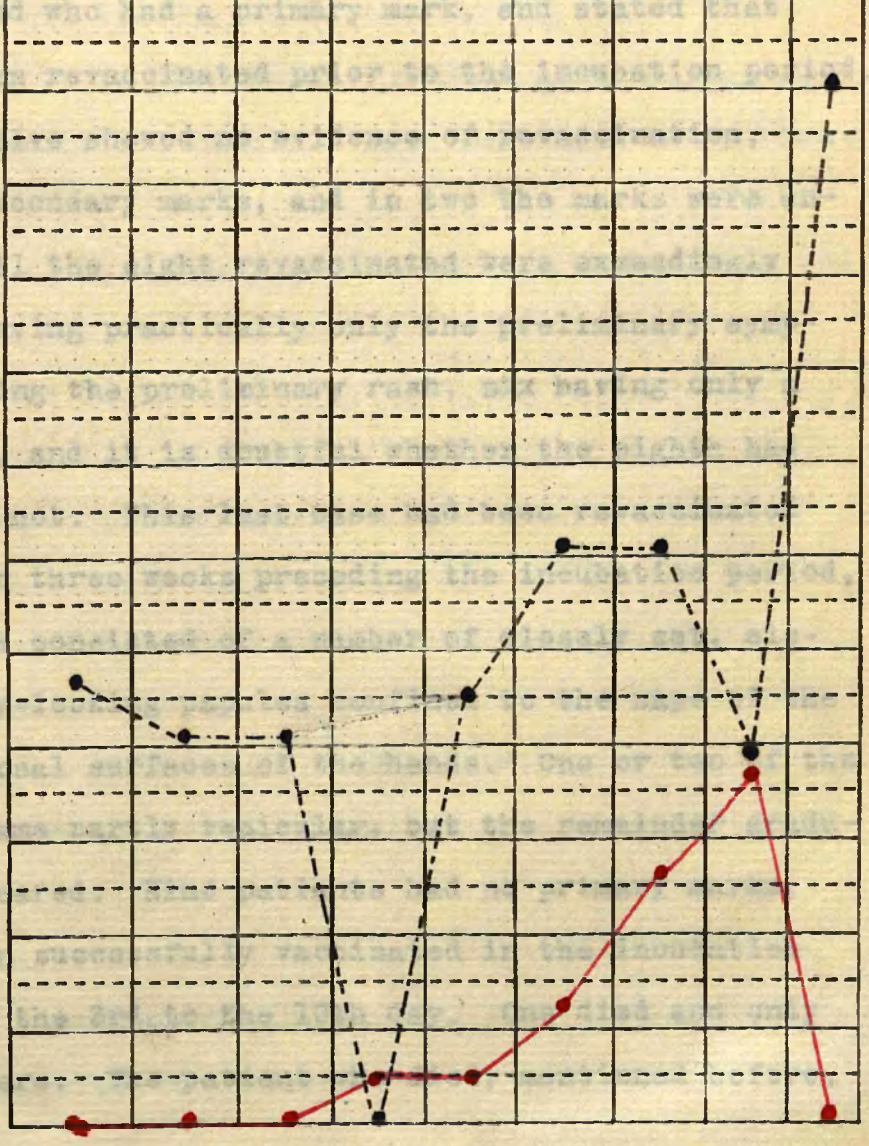
mark, but had been vaccinated on the fifth day of the incubation period. A sister, aged four, admitted previously with no mark, died.

Marson's Law[2] states that if a person be vaccinated later than the 4th day of the incubation period, the vaccination does not modify the Smallpox; but this case, along with others noted, seems to shew that protection is afforded even later than the 4th day. Of the other vaccinated children admitted, nearly all had only one small mark, and two had no primary marks but had been done, one on the 4th day of the incubation period, and one on the 8th day, yet both were mild. Many of these children were infected from their parents, and if the latter had been immune through compulsory revaccination, the children would not have acquired it.

TABLE SHEWING COMPARATIVE DEATH-RATE IN VACCINATED AND UNVACCINATED

CASES 477.

Death-rate per cent.	Under 1 Yr.	1 to 5	5 to 12	12 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70
100									
90									
80									
70									
60									
50									
40									
30									
20									
10									
5									
0									



Vaccinated - Continuous Line ——
Unvaccinated - Interrupted Line - - - - - -

The death-rate in vaccinated and unvaccinated increased from twenty years of age to between fifty and sixty when there was little difference, but between sixty and seventy, four who had no vaccination mark died giving a percentage of 100, but three who had a vaccination mark recovered, giving a percentage of 0. Twenty-two patients were admitted who had a primary mark, and stated that they had been revaccinated prior to the incubation period. Of these twelve shewed no evidence of revaccination, eight had secondary marks, and in two the marks were uncertain. All the eight revaccinated were exceedingly mild, one having practically only the preliminary symptoms including the preliminary rash, six having only a few papules, and it is doubtful whether the eighth had Smallpox or not. This last case had been revaccinated twice within three weeks preceding the incubation period, and the rash consisted of a number of closely set, elevated, angry-looking papules confined to the nape of the neck and dorsal surfaces of the hands. One or two of the papules became partly vesicular, but the remainder gradually disappeared. Nine patients had no primary marks, but had been successfully vaccinated in the incubation period from the 3rd to the 10th day. One died and only one was severe. The patient who died, mentioned before,

was six months old, had enteritis, and was only done on the 9th or 10th day. Thirty-five patients have been admitted who had primary marks, and had been vaccinated successfully at various stages of the incubation period. Practically all were mild except two, one of whom died. The latter, previously referred to, had pneumonia on admission, and was vaccinated on the 5th day.

Vaccination in the incubation period, as far as observed here, modifies Smallpox when performed later than the 3rd or 4th day. Cory, in favour of Marson's Law, quotes cases to shew that, where vaccination is performed by the 3rd or 4th day, the Smallpox rash is much less abundant in the vicinity of the $\frac{\text{mark}}{\text{rash}}$ and vice versa.

In a case observed here last winter, where a male, aet. 30, with no primary mark, had been revaccinated between the 3rd and 4th days, the rash was more abundant round the vaccination mark than elsewhere, but the patient was also protected. A vaccination mark as a rule, seems to act as an irritant in Smallpox, and more papules may be expected in its vicinity than on corresponding parts.

Three cases of vaccinia were admitted to hospital in the past winter as Smallpox. In two of these small secondary vesicles were present on the areola, and in

the third a rash of lichenous nature was present on the affected arm. Severe constitutional disturbance may ensue from vaccination apart from sepsis.

One of the cases of vaccination admitted was a female, aet. 19. The vaccination mark was in the early pustular stage, on admission measured about 2½ inches by 1 inch, and had been performed by a three-pronged lancet. The patient lay in a stupid, dazed condition with a temperature averaging 103° Fah., but twice reaching 104°, until the 8th day when it began to drop, and reached normal three days later. The patient was menstruating, but had nothing else to account for the severity of the illness.

On the other hand Glycerinated Calf Lymph may be at times inert. A child, aged five months, suffering from severe chickenpox, was admitted as Smallpox. Vaccination was twice performed without result, and the child took a mild attack of Smallpox. Pitting resulted from the Chickenpox, not from the Smallpox.

A male, aet. 26, who occupied the scarlet ward with between fifty and sixty children and one other adult, took Smallpox. None of the latter took the disease, nor did any other case occur in the hospital, as all over seven years of age were revaccinated unless they had secondary marks.

TYPE OF SMALLPOX. Smallpox here was much milder in the past winter than in the two previous outbreaks. The death-rate was only 7.9%, and a number of cases were never seen by a doctor, and so did not enter hospital.

There is evidence that Smallpox, in a well protected subject, may be little more than a severe headache, e.g. On 18th January, four young women who lodged in a single apartment, were admitted as probable cases of Smallpox. The first, aged 20, had six small primary marks, and one in the active stage done two days before she sickened. Typical prodromata occurred on 14th January, the rash appeared on the 16th, and ran a moderate course. The other three had been successfully revaccinated between two and three years previously. One, aged 18, had dizziness, shivering, sickness and backache on the morning of the 18th. There were on admission a number of tiny non-shotty papules scattered over the head and body which subsequently disappeared. The third, aged 17, had a headache on the morning of the 18th, but no rash except some purpuric spots on the back of the neck. The fourth had no prodromata, and only some atypical papules on the back, of which she knew nothing. Revaccination was unsuccessful in any of these cases. It was not, however, considered

justifiable to return them as Smallpox.

Owing to the prevalence of Smallpox in the various model lodgings, more men were attacked than women: 162 males were admitted and 65 females. Very few women had a severe attack, and four died, the latter being all unvaccinated cases.

PRODROMAL SYMPTOMS. Taking one hundred consecutive cases, I find that 43 had typical prodromal symptoms. The initial prodromal symptoms of the remainder were variable, and would not have given rise to suspicions of Smallpox except during an epidemic. Sore throat occurred in several cases at the beginning, an apparently unusual symptom at this stage. No case of paralysis of legs or bladder occurred as described by Trousseau.

Preliminary rashes were observed in 5.3% of the cases admitted last winter. These were all of the morbilliform or scarlatiniform type. In two the morbilliform rash was general, and in three the rash was scarlatiniform on the trunk, but morbilliform on the extensor surfaces of the arms and legs. Petechiae were frequently mixed with these rashes. Petechial stains were sometimes left especially on the arms when the measles rash faded, and persisted for a considerable time. In some cases the measles rash did not apparently fade, but the

elements of the rash becoming more and more concentrated finally elevated themselves into Smallpox papules with a roseolar margin. All these cases had typical prodromal symptoms, and all the patients presenting early rashes were vaccinated except one, a female, aged 32, who had an abortion and died. The later symptoms in some of these cases were severe; in others very mild. In one case, who had been successfully revaccinated, the early measles rash occupied the dorsal surfaces of the hands, and formed a collar round each wrist. The true rash, in this case, was practically absent, only a few tiny vesicles appearing on the forearms. If patients' statements may be accredited, of 100 consecutive cases, 54 noticed the true rash on the third or fourth day, twelve on the second day, ten on the first day, i.e., had practically no prodromal symptoms, 18 on the fifth day, three on the sixth, two on the seventh, and one on the eighth.

Trousseau states[3] that the earlier the rash appears, the more serious will the illness prove. This does not hold where cases occur, as in the past outbreak, with almost no prodromal symptoms. These cases were all mild except one, a male aged 54, in whom the rash became partly hemorrhagic. This patient distinctly stated that he was quite well until the rash appeared.

HEMORRHAGIC CASES. Twenty-six cases of Hemorrhagic Smallpox occurred in the past four years, and of these twenty-three died. Fourteen of these had no mark, ten had primary marks, one had a primary mark and had been vaccinated in the incubation period, and of one there is no note. The average age of these cases was 37.7.

In 1900-01, 5.12 of the cases were hemorrhagic and all died; in 1902-03, 10.4% were hemorrhagic and one recovered, whilst last winter 2.6% were hemorrhagic and two recovered. One of the latter was similar to six observed by Osler[4] where hemorrhage occurred into the rash in the vesicular stage, and then the rash aborted, followed by a speedy recovery. The patient was an alcoholic and unvaccinated. Sixteen males were affected and ten females, or 5.2% of the total males admitted, and 5.8% of females.

Osler states[5] that Hemorrhagic Smallpox is more common in males than females, and quotes twenty-seven cases where twenty-one males were affected and only six females. He does not, however, note the percentage to total males and females admitted.

The cause of hemorrhage in Smallpox seems to be generally considered due to an exceedingly virulent type of infection. I suggest that a predisposing cause of hemorrhage in Smallpox is a deficiency of excretion on

the part of the kidneys leading to an increased capillary congestion, and occasionally aided by sclerosed vessels, for the following reasons:-

(1) If due to increased virulence it should be most common in the very young, aged and debilitated, e.g., Hemorrhagic Scarlet is mostly met with in enfeebled children. But the above cases occurred in patients well nourished and in their prime, the average age being 37.7. Osler states[6] "young and vigorous persons are most liable to this form" and again "It is less frequent in children than in adults." No cases occurred in children here, and in children kidney disease is uncommon. An increase of pressure in the blood vessels of a child produced by an attack of whooping cough is recorded by Cory[7] as having caused hemorrhage into the vesicles of vaccination.

(2) Trousseau states[8] albuminuria is almost as common in Confluent Smallpox as in Scarlet Fever. There is this difference, however, that in scarlatina the albuminuria appears during the decline, and in Confluent Smallpox during the acute period of the disease .... Developed at the beginning of the attack, the albuminuria may continue to the end of it .... The same remark ap-

plies to hematuria, when it does occur it is at the commencement of the disease and not during the decline."

Any pathological condition of the kidneys should, therefore, easily lead to their disorganisation in the early stages of Smallpox, and throw an increased strain on the blood vessels.

(3) The following cases occurred here last winter. A male, aged 64, had a profuse papular rash with the appearance of becoming hemorrhagic. On the third day after admission he became very ill, had twitching of the right side of face and left side of body, stertorous breathing and lividity, and died on the afternoon of the same day. Port-mortem, a hemorrhage was found in the left hemisphere in the region of the internal capsule, the commonest site for hemorrhage in patients with atheromatous vessels. In a female, aged 47, a case of purpura variolosa, chronic granular contracted kidneys were found post-mortem; and in a youth, aged 19, who had marked albuminuria, a number of the pustules became hemorrhagic. It was also observed that in cases where a few pustules became hemorrhagic, this took place generally on the lower extremities where the veins are so frequently defective and the backward pressure is greatest.

SMALLPOX ACCOMPANYING OTHER DISEASES. The first case admitted in the recent outbreak was a male suffering from advanced phthisis pulmonalis. He was unvaccinated, and had a severe attack. Notwithstanding, he survived, and nine weeks after admission was returned to the Poorhouse whence he came, and died two days later from his lung condition. The third case, a male, also had a large cavity in his left lung, had a severe attack but recovered, and is still alive. Another patient, a female, aged 33, who was phthisical and extremely emaciated, also managed to survive a mild attack. Of several tubercular cases admitted one died, a little girl, aged six, who was unvaccinated. A male, aged 26, who was subject to occasional epileptic fits, was also admitted. On the day of his admission in the early papular stage, he had three fits, but with the progress of the disease these became more and more frequent, and were only checked by the administration of morphia. In a patient whose illness was complicated by locomotor ataxia, an increase of "lightning pains" and headache were the only prodromata. The lightning pains were severe during the whole course of the illness. Several cases were admitted with psoriasis and scabies. No curative effect was observed

on the psoriasis. In one case of scabies, the Smallpox rash was most abundant on, and almost confined to, the scabies area.

PREGNANCY IN SMALLPOX. Thirteen cases have been admitted in the past four years. Of these three aborted and died. One of the three was unvaccinated, one had a very small primary mark, and the vaccination of the third is not noted. The remaining ten did not abort, but one died. The latter case referred to previously had a primary mark, and had been vaccinated on the fifth day of the incubation period. She had a right basal pneumonia on admission, and was seven months pregnant. She was a severe hemorrhagic case, and vomited blood before death, but did not abort. Of the remaining nine, three were five months pregnant; one, six months; three, seven months; and two were confined in hospital, one four weeks, the other two weeks after admission. The former had a severe attack, the latter mild. Both children were healthy, were successfully vaccinated, and dismissed well. One case not included in the above thirteen aborted on the first day of the prodromal symptoms and recovered, whilst several were infected in the puerperium.

COMPLICATIONS AND SEQUELAE. A great variety of these occur in Smallpox, and are mostly due to the attacks of adventitious bacteria which may gain admission from the skin and air passages.

Acute croupous pneumonia occurred in one case at the beginning, and in another at the height of the illness. Pneumonia occurred in several cases at the end, of the broncho-pneumonic type, or as a further stage of basal congestion. Very rapid breathing may be noted in Confluent and Hemorrhagic Smallpox before any pathological condition can be detected in the lungs, probably due to poisoning of the respiratory nerve cells.

Erysipelas occurred as a sequela in seven cases, in one of which it proved fatal. From a slight ear discharge in one of these cases streptococci were obtained. Temporary mania occurred in two cases at the end of the attack. The other sequelae which occurred were, nephritis, acute and subacute, orchitis, pleurisy, with and without effusion, neuritis, rheumatism and otitis media. The commonest sequelae were eye complications, furuncles, and abscesses. None of the eye complications were severe. A few had corneal ulcers, and in these cases a

mild attack of iritis was present as a rule. Boils and abscesses are very common after severe cases of Smallpox. The explanation probably is that, in patients who have sufficient resistive power to escape fatal septicemia, the organisms are expelled from the blood stream and from local purulent collections. Trousseau states (9) that there is a true furuncular diathesis after the fourth week, and that the tendency to suppuration consecutive to Confluent Smallpox not only shews itself in an outbreak of boils, but also by the formation of abscesses more or less deep seated. This may be compared to what occurs after enteric, but from the abscesses in the latter the bacillus typhosus is obtained, whilst streptococci are obtained from those occurring after Smallpox. One of the worst possible septic cases occurred in a male, aged 46, admitted in January, who had a very slight vaccination mark. The attack was partly confluent, and after it, literally hundreds of abscesses were present. The subcutaneous tissue over the scapular regions sloughed, and was removed in large pieces, bed sores developed, and the patient was riddled with holes oozing pus. He recovered, but was not dismissed until 30th June, a prematurely aged, grey-haired man.

CASES SIMULATING SMALLPOX. A considerable number of the most diverse diseases have been admitted as smallpox. These include eight cases of chickenpox, three of scabies, three of vaccinia, two of syphilis, and also cases of urticaria, uremia, apoplexy, empyema, and pneumonia. The appearance of the pustules sometimes seen in scabies about the wrists, hands and fingers is not unlike that of Smallpox pustules in these situations. In chickenpox, apart from other differences, the oval shape of the vesicles can always be noticed, and in the axillary regions and flanks those of oval shape always run in the direction of the intercostal spaces.

CAUSE OF DEATH. In hemorrhagic cases death is probably due to asphyxia brought about by poisoning of the respiratory centre combined with the great loss of red blood corpuscles. When death occurs later, it seems often due to septicemia. It is often noticeable that the patient does not die until scabs have formed, or until these have fallen off, leaving a raw leeting surface.

Osler states [10] that death occurs at the 11th or 12th day at the height of the illness. Trousseau's view is different, and his explanation seems more correct. He says[11] "when the eruption has reached the 13th or

14th day, just when the swelling which has for two or three days left the face, appears in the extremities, the patient exhales, as I have already said, an unsupportable fetor .... This putrefaction has perhaps something to do with the serious complications which occasionally supervene at this period. There may be absorption of the putrescent fluids and miasms poisoning the blood, and producing in that way the grave symptoms which arise."

I suggest the following explanation. Streptococci and also staphylococci, multiplying and gaining virulence in the effete products of the skin, easily gain access to the blood owing to the patient's lack of resistance. If this should not happen, organisms from the air passages may gain admission, and bring about the same result. That this blood infection does not occur post mortem is shewn by the fact that, where in one case pure diplococci were cultivated from the blood of the various organs after death, the same organism was found in serum on the skin which had exuded from the vessels before death. If this blood infection be overcome, then local abscesses and furuncles will be formed. Streptococci are found in the blood more frequently than other organisms, and may be obtained occasionally in pure culture from the spleen.

Acting on the supposition that death was due to

blood infection from the skin, the last patient who died here, when it was evident from the severity of the attack that he was unlikely to recover, was treated by occasional injections of anti-streptococcus serum, and by keeping his body wrapped in sheets wrung out of weak carbolic lotion. Death occurred in this case on the 17th day after the rash appeared, several days later than in any other case. Post mortem no streptococci or staphylococci were found, but the diplococci mentioned above were cultivated from the blood of the various organs, and from serum on the skin.

Cultures from the last seven cases who died here shewed streptococci on four occasions combined with staphylococci, diplococci, or bacillus coli. One case shewed staphylococci and diplococci, one diplococci and one bacillus coli. Exposure of agar plates in the Smallpox ward shewed the presence of various organisms. On one occasion a plate was exposed in a Smallpox ward, and one in a Scarlet ward, from 4 to 4.30 a.m. Numerous colonies appeared, consisting in both of cocci, but the growths from the Smallpox ward were larger though the cocci were smaller than those obtained from the Scarlet ward.

GLYCOGENIC REACTION OF BLOOD IN SMALLPOX AND INFECTIOUS DISEASES. Smallpox is stated by certain observers to be the result of infection by a bacillus which is almost constantly present in calf lymph, and by others to be the result of protozoal infection[12]. Any evidence, however slight, in favour of one or the other should be of some value. The above reaction[13] is described in the British Medical Journal, April 1904. It is obtained by staining blood films with a solution of iodine and potassium iodide in gum acacia, and consists in a brown colouration of a substance allied to glycogen developed in the polymorphonuclear leucocytes in certain conditions. It does not appear in the other leucocytes present. It is elaborated by the leucocytes from the blood stream, as in cases where this reaction is present it is not found in leucocytes in the bone marrow. The nucleus of the corpuscles is not stained, and the colour may be evenly diffused through the corpuscle, or aggregated into clumps at the periphery. The reaction is obtained in the following conditions:-

(1) Severe disturbances of respiration
(2) Anemia
(3) Toxemias of metabolic origin, e.g., uremia and diabetic coma
(4) Suppuration and bacterial infection.

A reaction obtained in infectious diseases should therefore point to (4) as the causal agent. In Smallpox a number of leucocytes appear similar to those normally found in the bone marrow, but a marked positive glycogenic reaction is present in the polymorphonuclears. The reaction may not be obtained in a mild papular stage, but as soon as the pocks begin to get pustular, the reaction appears and becomes more intense as pustulation proceeds. The intensity of the reaction is comparable to that which occurs in puerperal fever, erysipelas and scarlet fever. In erysipelas, for example, when the inflammatory process is extending, the reaction is marked, and with a cessation of spreading, the glycogenic reaction disappears.

In a few cases of Chickenpox in which I have tried this reaction, it has been present but not so marked as in Smallpox. The reaction is constantly present in diphtheria, diphtheritic croup, and measles. It is, however, present in urticarial rashes following for example the injection of antidiphtheritic serum, but these cases should be classed under (3). In enteric fever the reaction is almost negative. Apart from the absence of leucocytosis, very few leucocytes shew the reaction, and it is valuable for diagnosis in the early

stages, excluding such conditions as meningitis, pneumonia, and suppurative conditions of all kinds. The evidence obtained from this reaction, therefore, helps to place Smallpox in its proper place among the specific infectious diseases, and lends weight to the argument that Smallpox is a bacillary disease.

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WESTERN TYPEWRITING & SHORTHAND OFFICE,
113 WEST REGENT STREET, GLASGOW.